REMARKS

This application has been carefully reviewed in light of the Office Action dated October 10, 2007. Claims 1, 2, 4 to 6 and 9 to 14 are in the application, of which Claims 1, 2, 6 and 9 are independent. Reconsideration and further examination are respectfully requested.

Claims 1, 3 to 6 and 8 were rejected under 35 U.S.C. § 102(e) over U.S. Patent 6,738,398 (Hirata), and Claims 2 and 7 were rejected under 35 U.S.C. § 103(a) over Hirata in view of Japan 1-183180 (Kondo). The rejections are respectfully traversed, primarily for the reason that Hirata's DBR section is believed to operate by modulating intensity as opposed to the invention's modulation of wavelength. This is explained more fully below.

The invention concerns a modulation light source comprising a DBR laser which outputs a fundamental light and a light wavelength conversion device which receives the fundamental light from the DBR laser and performs wavelength conversion to produce a second harmonic light. Conventional attempts to obtain modulation in intensity of the second harmonic light have revolved around various techniques for modulating the intensity of the DBR laser's fundamental light. These attempts are described in the background of the present application, and one example is the applied Hirata patent.

The inventors herein have identified problems with these conventional attempts, many of which relate to temperature effects that result when modulating current to the DBR laser. They have departed from these conventional attempts based on the

observation that the wavelength conversion device has an intensity curve such as that illustrated in Figure 2 of the subject application. When the DBR outputs fundamental light whose wavelength is close to the phase matching wavelength, then the wavelength conversion device outputs a second harmonic light whose intensity is close to 100%. On the other hand, when the fundamental light output by the DBR laser is deviated substantially from the phase matching wavelength, then the second harmonic light produced by the wavelength conversion device is substantially zero percent.

Based on this observation, the inventors herein decided to modulate the fundamental light of the DBR laser primarily in wavelength, rather than primarily in intensity.

Thus, as set forth in independent Claim 1 herein, a modulation light source for an image display comprises a DBR laser which outputs a fundamental light, and a wavelength conversion device which is characterized by a phase matching wavelength. The wavelength conversion device is arranged to receive the fundamental light output by the DBR laser, and outputs a second harmonic light in response to receipt of light whose wavelength is substantially near the phase matching wavelength. On the other hand, the wavelength conversion device outputs substantially no second harmonic light in response to receipt of light whose wavelength is substantially deviated from the phase matching wavelength. The DBR laser includes a DBR part, a phase part and a gain part, and a controller is provided to provide a prescribed current to the gain part and to the phase part, respectively, and to provide a current to the DBR part based on a PWM signal in which pulse width is modulated corresponding to an image signal. As a result, a wavelength of

the fundamental light is modulated so as to deviate from the phase matching wavelength of the wavelength conversion device.

The applied patent to Hirata differs from this arrangement, since as indicated above, it describes an arrangement in which intensity modulation of the second harmonic light is obtained by modulation of the DBR laser's intensity, and not the DBR laser's wavelength as claimed herein. More specifically, Hirata also recognizes that the intensity of second harmonic light depends on wavelength of the DBR laser, and provides in Figure 2 a graph of output intensity that is somewhat reminiscent of Figure 2 herein. Hirata's solution, therefore, is to carefully control the frequency of the DBR laser, so that its wavelength is precisely that of the phase matching wavelength of the second harmonic generation device.

The Office Action relies on Hirata's seventh embodiment, which is described beginning at column 16, line 9. As explained there, Hirata provides a drive circuit 31 which varies the DBR drive current and the phase control current at a rate of change represented by the slope of line segment "a" shown in Figure 28, with the active region drive current being kept constant. See column 17, lines 15 to 24. Along this line segment a, frequency of the fundamental wave produced by the DBR laser is constant, and its intensity is modulated. Thus, Hirata's seventh embodiment describes a mode of operation which is distinctly different from that claimed herein, in which the fundamental light of the DBR laser is modulated in wavelength.

Kondo has been reviewed, but it is not seen to supply the omissions of Hirata as a reference against the claims. In particular, Kondo is not seen to be pertinent to

the invention herein, which involves a second harmonic generating device in which a fundamental light output from a DBR laser is modulated in wavelength based on a current to a DBR part based on a PWM signal in which pulse width is modulated corresponding to an input signal.

Allowance of Claim 1 is therefore respectfully requested.

Independent Claims 2, 6 and 9 also involve modulation of a light source, and include a wavelength conversion device and a DBR laser which outputs a fundamental light which is modulated in wavelength. Allowance of these claims is also respectfully requested.

No other matters being raised, it is believed that the entire application is fully in condition for allowance, and such action is courteously solicited.

Applicants' undersigned attorney may be reached in our Costa Mesa, California office at (714) 540-8700. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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